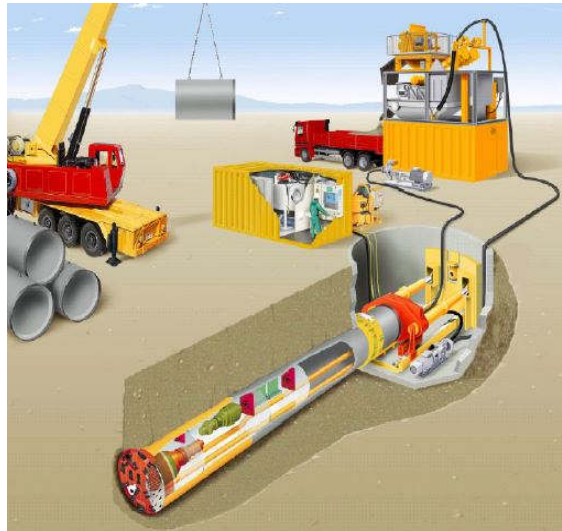
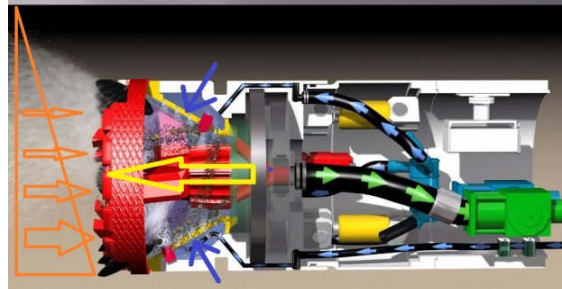


Why Microtunnelling?

Throughout the world, microtunnelling is becoming increasingly important for the installation of service pipes and sewer pipes. The combination of microtunnelling with pipe jacking offers numerous advantages, especially in urban city areas:

- It is suitable in nearly all geologies
- The method is safe with un-crewed underground operations
- Inclined pipe jacking and three dimensional curves are possible
- It causes minimal traffic disruption along the construction route
- In contrast to conventional methods, it is an environmentally friendly method that helps to conserve protected landscape areas (due to minimum excavation and dewatering)
- Fewer stoppage periods due to weather conditions
- Minimum soil quantities to be disposed of
- Sub-leasing of microtunnelled pipeline sleeves makes it a popular trenchless solution, especially in congested city areas.
- Not affected by poor soils and high water tables
- Cost Effective Solution with minimum disruption and shorter construction period.



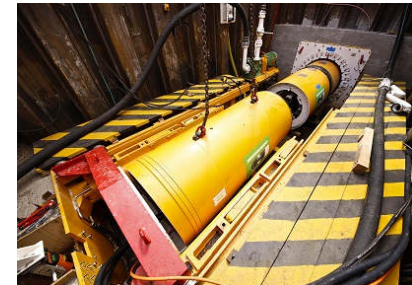
CSV Construction (Pty) Ltd



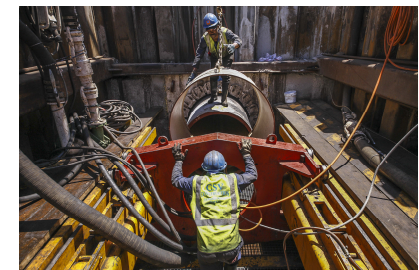
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CSV Construction Microtunnelling



AVN 800 XC



**World Leading Technology Leading
to Safe and Risk Free Tunnelling**

Our Track Record

A. Our Capability

- Personnel with extensive experience in microtunnelling, deep foundations and shoring gained both locally and internationally.
- Close relationship with equipment supplier, Herrenknecht, a world leader in the manufacturing and operation of Tunnel Boring Machines
- Experienced TBM operators (Supplied by Herrenknecht International)

We currently offer the following microtunnelling options

i. Soil Conditions

- Soft Soils up to 7Mpa in hardness (Soft Ground Cutter Head)
- Mixed Soils with boulders up to 40MPa UCS value (Mixed Ground Cutter Head)
- Rock tunnelling (Hard Rock Cutter Head)
- Water table up to 30m deep. No dewatering required

ii. Sizes and Pipes Offered

- Concrete Jacking Pipes with butt ends, steel bands and rubber ring seal as sleeves
 1. 970mm ID, 1170mm OD (2m long)
 2. 1117mm ID, 1370mm OD (2m long)
- Concrete jacking pipes as product pipes
 1. Similar Sizes in OD. ID can be reduced to minimum 600mm
 2. HDPE AKS Lined to any thickness
 3. Stainless Steel Bands available
 4. Exposed concrete can be epoxy coated for sewage applications
- Ductile Iron XTJ Steel Jacking pipes in 4m lengths
 1. 1000mm ID, 1170mm OD, Class K9 Complying with BS EN 545:2006 with a rated working pressure of 30bar
 2. Spigot & socket joining system with EDPM Elastomer rubber seal
 3. Cement lined for potable water pressure mains or PU lined for sewage rising mains

B. Our track record

i. Some of our 18 No successfully Completed Tunnelling Projects

- Cape Flats 3 – 1196m of 1,0m diameter Sewer Rising Mains installed in 8 separate jacks to a vertical tolerance of 14mm. Lengths of installations vary from 40m to 218m
- Nooiensfontein Tunnel – 68m of 970mm ID Concrete Sleeve pipe to take a gravity sewer product pipe installed under the Stellenbosch Arterial road to a tolerance of 3mm
- R300 Tunnels – Two tunnels of 1117mm ID concrete sleeve pipes 63m and 88m long at a depth of 7.5m underneath the Stellenbosch Arterial Road and R300 freeway.
- Port Elizabeth Deal Party and Humewood tunnels at depths to 18m in varying soil conditions to lengths of 168m
- Various N2, R300, Delft Main Road and Railway crossings to various lengths and depths as sleeves for high pressure and flat gradient sewer gravity pipelines to be sliplined.
- R44 Adam Tas crossing in Stellenbosch with Granite boulders and high water table. 970mm dia sleeve was sliplined with 600mm GRP sewer pipe and 3x160 and 4 x 100mm uPVC ducts.

How does the Herrenknecht AVN Tunnel Boring Machine work?

AVN machines belong to the category of closed, full-face excavation machines with a hydraulic slurry circuit. The soil to be excavated is removed using a cutter head adapted to the expected geology, be it soft soils or hard rock, making it possible to use the machines in almost all geological conditions. A cone-shaped crusher inside the excavation chamber crumble stones and other obstructions to a conveyable grain size while tunnelling and advancing; this debris is removed through the slurry line to a series of settlement tanks where the solids are settled out and the water returned to the system. The jacking shafts are constructed with steel sheetpiled shafts in most any soil conditions. A hydraulic jacking frame advances the TBM and trailing jacking pipes forward. A high degree of accuracy is offered due to a laser and computer controlled guidance system.



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